APE AND MAN

By HANS WEINERT

Since prehistoric times man has been attempting to unravel the secret of his origin, and as long as man continues to exist he will continue to do so. One may doubt whether he will ever succeed, and whether he will ever come much closer to actual facts than he did in his old myths. Is not modern science's explanation just as fantastic? And yet it is fascinating to follow the scientist as, with the aid of fossil remains and ancient bone discoveries as well as of the most modern archaeological and biological knowledge, he gropes his way along the long road from present-day man back to the very beginnings of organic life, giving us a breath-taking perspective of the place of man in this world. With every new scientific discovery, our conception of the origins of man are changed. In the following article we present the latest theory of a German scientist, Professor Hans Weinert of the University of Kiel, among whose many books "The Origin of Mankind" is the best known.—K.M.

THE basis of our present attitude toward the history of man is the realization that the advent of man on the earth was neither predestined in any way nor, as a matter of fact, even necessary. The earth would circle around the sun as a planet even if man had not come to be on it, and just as this was the case before the advent of man, so it will continue to be after the last man has perished on earth. Today we are able to prove what manifold different circumstances had to occur in the course of the earth's history in order to enable the development of the species "man." Often it was a matter of "minor coincidences" that the route of development toward man was not closed for ever. And it is difficult for us to imagine that all these causes, which together resulted in the coming of man, could ever come about again. Hence it is by no means such a matter of course as many people believe that there are human beings living on other stars. Although we can reckon that, on those planets which have passed through a development similar to the earth's, living creatures have developed, it is to be denied rather than assumed that such organisms have developed into the same forms as those living on the earth.

THE ORIGIN OF ALL LIFE

It goes without saying that, as long as the earth revolved as a ball of liquid fire around the sun, no life whatever was possible on it. The origin of life, or the determining of the border line between the inorganic and the organic, is a chemical problem. With few exceptions, all living organisms are today dependent on the carbon-dioxide assimilation of plants. Consequently, we can only assume that all life must have begun with this chemical process. Carbon, oxygen, hydrogen, and nitrogen are the basic elements of chlorophyll-like substances—such as the "leaf green" now contained in all green plants —and possess the prerequisite for assimilation, as long as the sun supplies the necessary energy by means of its light and heat.

All these conditions were present on the earth. We do not have to turn to cosmic rays or supernatural or metaphysical proofs for the origin of life. However, the carbon hydrates produced by assimilation as well as the albumen compounds built up with their aid could only occur and live within narrow limits of temperature. We have no reason to assume that this may once have been otherwise. Consequently, after water had precipitated on the hardened earth's crust, this latter must have cooled off to such an extent that the most primitive processes of life were able to take place.

Since under normal conditions we ascribe the possession of chlorophyll to the plant world, life on earth must have

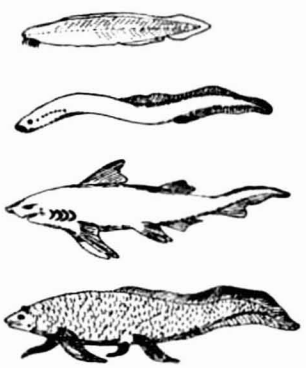
begun with an "original plant," even if this "plant" consisted only of a tiny lump of chlorophyll. We do not know how far the plant world developed before the first animal grew from it. Actually, it is quite possible that animals grew from plants in more than one case, if we define the difference between plant and animal by the purely chemical difference of nourishment. For it was, of course, possible that plants which had not yet reached the stage of the cell or which consisted of a single cell or even several cells lost their chlorophyll and thereafter became animals by the fact that they fed on other substances.

AMPHIBIAN ANCESTORS

The present animal world, including man, must be regarded as uniform in its origin. It is not possible to imagine or prove a separate origin for man. The human body is so unmistakably that of a vertebrate animal that it is quite unnecessary to look for any relationship among the invertebrate animal families.

The hour of birth of the vertebrates—which developed from fishes—cannot be exactly determined. At any rate, the ancestors of man must also be sought among the fishes. For the time being, these ancestors had to live in the water. For, although various plants and invertebrate animals had at that time already conquered land, the vertebrates were bound to the water by the fact that they breathed through gills. Thus the problem of how these water vertebrates turned into land animals includes part of man's origin. Sharklike species of fish may have been among our ancestors, until the first amphibians crawled onto land.

Perhaps it was the swampy forests of the Carboniferous which saw the first land vertebrates. And, since newts or salamanders were at that time the only vertebrates to move on land, man's ancestors must also have lived in the form of these amphibians. The newts themselves developed from ancestors resembling pulmonate fish, but only as the result of their changing environment and their struggle for existence. As the water receded during the Carboniferous the animals were left on dry land, just as may have happened in many millions of years before them to innumerable ancestors of theirs and as is still happening today to their descendants. But at that time, in contrast to all previous periods, something new had occurred: among these animals there were fish which we have described above as "pulmonate fish"; that is to say, the air bladder, which they had once developed from a bulge in the front intestine for purposes of buoyancy, had, as the result of arteries developing along its walls, become able to breathe oxygen from the air. Thus these fish were able to cope with the change in environment by adjusting the function of an already existing organ, and thereby to avoid extinction.



Early evolutionary stages of the vertebrates: the primitive lancelet, followed by the lamprey, the fin-bearing shark, and finally, the pulmonate fish with its "leg" fins—the ancestor of the amphibian

THE "UNHAPPY HUMAN SINNER"

We must not imagine that Nature foresaw the receding of the waters. If at that time all fish had been left on dry land, without having the possibility of absorbing oxygen from the air in breathing, all fish would simply have died out, and man would never have developed. Nevertheless, the earth would have continued to exist, and there is not even any reason for us to assume that new fish would have developed from worms which, in their turn, could have become land vertebrates and finally human beings. This is what is so important for the correct understanding of the interplay of geological events and hereditary mutations: never is there a repetition of exactly the same conditions

Skeleton of a prehistoric newt
(cacops aspidephorus)

as a whole. And those animal species whose ancestors were able, millions of years ago, by mutation to produce something new, are not necessarily able to produce the same over again.

It was not the possession of lungs alone which enabled the newts to survive the receding of the waters. The first newts had something else which was indispensable for human development. Their physical build was so far advanced that it was possible for the people of 1726 A. D. to mistake the fossilized skeleton of a giant salamander for that of an "unhappy human sinner." The body of the first land vertebrates can already be divided into head, neck, trunk, tail, and limbs. And it was the limbs which, in addition to the lung, were the means by which the land vertebrates survived. If the fish had not already—again for another purpose—developed their two pairs of pectoral and ventral fins, the later pulmonate fish could not have developed into newts with organs of propulsion. As it so happened, however, the stranded pulmonate fish did not need to remain prone or to move around laboriously by crawling on its stomach: instead it could introduce with its legs what was for the vertebrates a new type of propulsion, one which today seems so natural to us.

It is not possible to tell from fossil skeletons when the amphibian newt developed into a reptile that was entirely independent of the water. For this step did not entail any essential change in the physical build. However, by means of internal fertilization and of the immersion of the embryo in the amniotic fluid—which latter replaced the familiar water environment—a new step had been reached, the first to deserve recognition as representing the true land vertebrate.

HAIR AND FEATHERS

As is the case in most mutations of species, the origin of the mammal within the entire genus of reptiles must be sought at a very primitive stage of development. All the manifold varieties produced by the reptiles in the course of the Mesozoic have nothing to do with the development of man. Even the one invention which was important for the development of mammals, namely, the covering of the body with an insulating layer of horn, was made at a primitive, premammal stage. In other words, the hair covering, the fur, of the mammals, was first developed by certain lizardlike reptiles. In this way, a serious limitation in the life of the reptiles was overcome; for all reptiles, whether lizards, snakes,

THE AGES OF THE EARTH

(Read Up)

GEOLOGICAL ERAS	GEOLOGICAL PERIODS	FIRST APPEARANCE OF
CENOZOIC	Holocene	
	Pleistocene	Man
	Tertiary	Primates
MESOZOIC	Cretaceous	
	Jurassic	Birds
	Trias	Mammals
PALEOZOIC	Permian	Reptiles
	Carboniferous	Amphibians
	Devonian	
	Silurian	Fishes
	Cambrian	Lancelets
PROTEROZOIC	Pre-Cambrian Strata Precipitation of Water Hardening of the Crust	Annelid Worms Algae Origin of Life
ARCHEOZOIC	Fiery-liquid Gaseous Condition	No Living Things

crocodiles, or turtles, are dependent on the temperature of their environment. The temperature of their blood corresponds to that of their surroundings, and their breathing is slowed down as soon as the lower level of temperature required for it is passed. Hence the warm Mesozoic offered ideal conditions for the reptiles in most parts of the earth's dry land, conditions which these creatures made use of by developing a wealth of multifarious varieties on land, in water, and in the air.

An insulating covering was invented once again by the reptiles during the Jurassic period and independently of the older development of a hair covering. Lizardlike reptiles gradually developed feathers from their scales and thus turned into birds. This feather covering gave them, just like the mammals, possibilities of life which were considerably less dependent on the surrounding temperature. This, however, is the only relationship that links the species of birds with the mammals; in every other respect they are the descendants of reptiles developed solely as flying creatures.

Reconstruction of a transitional form between reptile and mammal

Throughout the Mesozoic we find fossil remains which must already be ascribed to mammals. Thus mammals must have developed from primitive, lizardlike reptiles in the early Mesozoic. While these mammals differed by their hair covering and the ensuing advantages of existence from their reptile ancestors, for a long time they departed very little from them in their physical build and their manner of existence. They must have been ratlike animals which, however, were not rodents but carnivora.

VICTORY OF THE MAMMALS

For a long time, many millions of years, the mammals were unable to play any important role on the earth. During this time they appear to have kept their original shape with slight alterations. The preponderance of reptiles during the entire Mesozoic has often been held responsible for the suppression of the mammal family; of course, nothing definite can be said in this respect. The fact remains that, with the dawn of the Cenozoic, the geological age which reaches up to the present day and whose first period is called the Tertiary, the reptiles largely disappeared from the earth and were replaced by the mammals.

In a wealth of forms which once again repeated everything that had already been invented by the reptiles, the mammals now populated the earth. It can be understood that one should speak of an explosive diffusion. For we must bear in mind that, at the beginning of this development, the ratlike animal form contained everything that developed, comparatively quickly, during the Tertiary period into what we now know as mammals. The subsequent periods, known as the Pleistocene, or glacial age, and the Holocene, or present period, have been of little importance to the development of varieties among the mammals—with one exception. Whether we consider a harvest mouse or an elephant, a bat or a buffalo, a tiny shrew mouse or a lion, a monkey or a giant whale—they are all mammals, mutations of the one, lizardlike form which came from the Mesozoic into the Tertiary. Our ordinary zoological knowledge is quite insufficient to embrace the manifold varieties of all the mammals which have developed since the early Tertiary, especially if we bear in mind that we neither know nor are able to reconstruct all those varieties which have meanwhile died out without leaving any descendants.

BROAD- AND NARROWNOSED PRIMATES

But, again, all these manifold forms had nothing to do with the development of man. There is only one single branch which included our ancestors: the early primates, now represented by the lemurs. The only thing by which the carnivoralike lemurs remind the layman of apes is

their prehensile hands. The formation of this organ is, of course, linked up with their life in trees; at the same time, however, it is the necessary condition which has made possible the evolution of man as he now is. We must assume that the true ape developed during the early Tertiary. With this we have reached a period which enables us more exactly to determine the ancestors of man.

With the very first appearance of apes we are able to distinguish between two pronounced groups. The difference has a geographical basis. In America we find the platyrrhinians or broadnosed apes which, if we consider their entire development, have remained at a primitive stage and have never produced anything but American apes. It is only among the catarrhinian or narrownosed apes of the Old World that we find the ancestors of man.

Even the most primitive apes of the Old World present, in spite of their physical smallness, an exact anatomical pattern of man. The arrangement of the teeth is enough for systematic zoology to class man as a species of the catarrhinian ape. But the whole anatomical plan of the latter's body, with all its bones and muscles, its nerves and vascular system, and the entire arrangement of its intestines, is so very much the pattern for the human anatomy that it is impossible to imagine the existence of man as being separate from the development of true apes. Anyone who has ever wondered at the resemblance of apes to human beings would be even more amazed at this resemblance if he had the opportunity of observing the dissection of the body of an ape.

THE COMING OF "MANLIKE" APES

Nevertheless, the development from ape to man was no small step. Seen as a whole, the Tertiary was a warm period, and all the apes of the Old World are, with very few exceptions, tropical jungle dwellers. And the jungle, especially that of the tropics, is certainly no place for the development of man. As long as the Tertiary with its warm climate continued, therefore, there could be no thought of man, in spite of all the anatomical similarities between ape and man. The apes had time and space enough to spread; on the other hand, they did not live so untouched by the struggle for existence that they could simply become fixed in their forms. But everything they produced during this tropical Tertiary was only other apes. It is impossible to discern any necessary reason for human development.

Not until the second half of the Tertiary did there evolve new forms of apes, which have been termed without hesitation "anthropoid (manlike) apes." What is essential in the whole outward appearance of these apes is not only their similarity to man—this we have already observed with earlier apes—but their human form, which distinguishes them from all other apes more than anything else by their size.

Like the primitive apes, the anthropoid apes once inhabited all three continents of the Old World. Today their representatives, the orangutan in Sumatra and Borneo and the gorilla and chimpanzee of the tropical jungle of Africa, are, geographically speaking, widely separated. The remains of anthropoid apes dating from the late Tertiary have also been found in India. Nevertheless, an anatomical division into two groups can be distinguished in the middle Tertiary, a division which was to become important for our own evolution. Asia produced a different form of anthropoid ape from the western part of the Old World, viz., Europe and Africa. Thus we are able to draw anatomical as well as geographical distinctions between early orangutans on the one hand and chimpanzee- and gorillalike forms on the other. Orangutan fossils have been found, not only in the Sunda Isles—which once were part of the mainland—but also in India and in East Asia near Peking. The remains of chimpanzee- and gorillalike forms were discovered long ago in Europe; and a few years ago Tertiary remains of them were also found in their present home of Africa.

OUR CHIMPANZEE RELATIVES

The fact that these two groups of anthropoid apes, the eastern and the western, are not identical is important for our evolution. Many anatomical, embryological, physiological, and psychological comparisons prove that it is impossible to establish a genetic link between the human race, or individual parts of it, and the orangutan. On the other hand, the gorilla and the chimpanzee possess identical characteristics which distinguish them from the orangutan; moreover, these very characteristics which distinguish them from their ape-cousin link them to man. For this reason, we shall call gorilla, chimpanzee, and man the "summoprimates," meaning the most highly developed primates now existing and a group of species related by common genetic characteristics.

Common genetic characteristics are not acquired by chance: they can only have been handed down as a common heritage by common ancestors. Hence there is no possible reason to doubt the common heritage of gorilla, chimpanzee, and man. However far removed man is from the animal world, the germ plasm has not let itself be induced by this to abandon or alter common genetic characteristics.

FLIGHT, DEATH, OR ADAPTATION

As long as the anthropoid ape could remain in the jungle, he remained what he was. What happened, however, was that, in certain parts of the earth, this jungle life did not continue without interruption. During the last phase of the Tertiary, changes of climate set in which finally led to the coming of the glacial period. The Tertiary gave way to the Pleistocene; and, except in the equatorial regions, the Pleistocene created greatly changed conditions of life. Approximately five hundred thousand years ago, the Northern Hemisphere of the earth cooled off to such an extent that jungle-covered areas lost their forests. As a result of the spreading of glaciers, which formed on the Scandinavian mountains as well as all other high mountain ranges, climatic conditions were created which rendered the former tropical jungles impossible for all of Europe and for the northern, interior part of Asia. This direct effect on the flora naturally also influenced the fauna dependent on this flora. Animals accustomed to the jungle had to adjust themselves to the new conditions.

There were three ways in which the animals accustomed to heat could react to climatic depressions. The simplest was migration to warmer zones; and it is important for the evolution of man that, owing to mountain barriers, a mere flight to the south was not without its obstacles. An enforced stay in unaccustomed surroundings could, furthermore, lead to extinction, a fate that is sure to have befallen many species. Of course, one must not imagine that all the individuals of one species or family were suddenly overtaken by death. At first, the deterioration in the conditions of life will have made itself felt by reduced propagation; then perhaps it followed that the young were affected to such an extent that they themselves never reached the stage of propagation. If the species were then also to be affected by diseases, etc., the last remainders of a surviving genus would actually disappear quite rapidly. Finally, there is a third possibility, in that, by mutation, a new form was created which could cope with the changed conditions.

EXCURSION ON HEREDITY

This, then, is the possibility which applies to our case. Our present knowledge of the laws of heredity teaches us that environment cannot create new forms simply by its effect on the body. The totality of all hereditary qualities must be so constituted that, by the mutation of individual genes, a change in form is achieved which is able to exist under the new conditions. For this reason, highly specialized species are little suited for such new forms; on the other hand, the step to the new form can also not be so great as to produce something entirely new. Thus it is by no means the geological circumstances alone which are responsible for the evolution of new species. There were glacial ages before,

connected with climatic depressions, which also swept away jungles from the earth; but no glacial period was able to turn a shark or a newt into man. A preliminary step, in physical as well as mental respects, had first to be reached from which a mutation to man, not an entirely new creation, was possible.

Thus, as long as Nature had not yet produced the anthropoid apes from the early primates, no influence of environment and no mutation of genes resulting from any other causes would have been able to evolve the form of man with all its physical and mental hereditary characteristics. Herein lies the value of our present knowledge of summoprimates, that it links animal species to man which, by reason of their common heritage, cannot be imagined individually or without man. Indeed, science has progressed one step further: not only do gorilla, chimpanzee, and man form a unity of species which later split up—how, we do not know—into the three species still extant; the same reasons that force us to recognize summoprimates have also led us to make another differentiation within this group. In addition to the hereditary characteristics common to all three, there are other hereditary traits which the chimpanzee shares with man but not with the gorilla. This discovery does not, however, mean that chimpanzee and man are more closely related than the two ape species. Gorilla and chimpanzee are so closely related that, from a zoological point of view, it would not be impossible to regard them as two varieties of one species. But, in spite of this close relationship—and this is a fortunate circumstance for research into the evolution of man—there are some hereditary characteristics which the chimpanzee can only have acquired after the gorilla had already branched off from it while the ancestor of man was still linked up with it. Thus we see that, at the end of the Tertiary, a form of anthropoid ape had been reached possessing every essential prerequisite for the evolution of a creature which could no longer simply be called an anthropoid ape.

DOWN TO EARTH

Fossil remains found in Central Europe have proved that chimpanzeelike anthropoid apes once lived there. It is possible that at first they lived in trees. Later, however, they moved down to the ground. It is certain that these apes did not descend from their trees for the fun of it; no ape accustomed to jungle life would do that. But when the climatic depression of the coming glacial period removed, so to speak, the forest from under their feet, this naturally affected them. We are unable to tell to what extent they died out. It seems very improbable that all anthropoid apes were able to migrate to the remaining jungles; for the whole long mountain range from the Pyrenees and Alps via the Caucasus right into Asia must have formed a barrier during the ice age which separated the anthropoid apes of the north from those of the south. Hence we can hardly assume that the African jungle chimpanzee was our ancestor. As the tropical jungles of Africa have undergone no important geological changes since the end of the Tertiary, the chimpanzees inhabiting them had no reason to give up their jungle life and to become human beings.

For a long time Central Asia was regarded as the original home of mammals and also of man. We can only say that there are neither positive indications nor logical reasons for this hypothesis. No fossil remains of anthropoid apes have been discovered in Central Asia; and, if we consider the geological conditions of those regions, we can hardly expect to find any there. For we cannot expect early man in a region which never had any primates or catarrhinian apes. It would be just as illogical to seek for the cradle of man in America or at the North Pole or in Australia.

MANKIND'S HOUR OF BIRTH

The question will always remain as to from what point of view we are to distinguish between man and beast. Although nowadays there is no longer any possibility of confusion, it is quite clear that, for long periods during the early

stages, it is difficult to decide whether we are dealing with manlike apes or apelike men. The only thing we can do is to introduce artificial means of distinction which we shall regard as our standards. Probably the best of these arbitrary standards is the knowledge of the use of fire.

Today all human beings make use of fire, while no animals, not even the anthropoid apes, have learned its use. This does not mean to say that monkeys, like the carnivora, are not able occasionally to take advantage of a fire, either for warmth or for the easy acquisition of burned prey. But no present-day animal has realized that one can make use of fire according to one's own needs. This realization must have been reached at one time or another in the evolution of man, and we may well call this deed of Prometheus mankind's hour of birth.

We must not imagine that this event took place suddenly. It may have been a long time before the outstanding action of a genius appeared so convincing to his fellow creatures that its application could never again be forgotten. This conception of the first conscious use of fire as the hour of birth of mankind also fits into the geological conditions. Anthropoid apes accustomed to warmth lost their jungle, and Nature offered them the substitute of fire if they were capable of making use of it. This was possible under two conditions: first, there had to be a brain which was capable of grasping the idea and of realizing its consequences; and then there had to be hands which could follow up the idea with the deed. Only hands were able to seize a stick which had caught fire from natural causes, and to protect the fire and keep it going. And both these conditions were fulfilled by the chimpanzeelike anthropoid ape forced to live in unaccustomed, cold surroundings.

Of course, this idea is only the product of logical reasoning; we are unable to prove the actual facts of this process at any point of the earth. Yet it is by no means pure fantasy when we imagine creatures, which we still call anthropoid apes, sitting around a purposely kept fire and enjoying its warmth and the protection it offers against the dreaded wild animals; when we imagine them roasting their prey in the fire and appreciating the unusual flavor. We must add that we can only imagine social animals with a strong urge for imitation and a sense of curiosity living in this manner. And it is a well-known fact that chimpanzeelike apes are so inclined.

MAN, THE DOMESTIC ANIMAL

This short sketch of human evolution must suffice here, and we can only point out that all subsequent developments and events do not in the least contradict this conception. Everything else that distinguished man from the beast can be explained by the use of fire, whether it is the disappearance of the hair covering or the decrease in size of the canine teeth, which till then had served as the most important weapon. Clothes that could be changed and man-made weapons and implements indicate the beginning of the most primitive culture. The possession of fire and the making of tools forced early man to communicate about abstract matters too.

Thus the first hearth was the first sign of incipient domestication. Man became a "domestic animal" and subjected himself to all the consequences to which all domestic creatures are liable, also with regard to their hereditary characteristics. This means that the changed conditions of life of a domestic animal—which is more or less withdrawn from its natural environment and the consequent conditions of existence—provide more occasion for genetic mutation than is the case with wild species. Hence the manifold division of mankind into races and subraces by no means conflicts with the unconditional assumption that the human race arose from a single common parent form.

NO MISSING LINK

The German scientist Ernst Haeckel came to the conclusion that, in his earliest stages, man must have been a sort of

ape-man or "*pithecanthropus*," to use the Greek term he invented. Today we know that there were really such ape-men and that they have given us the final proof of the ape-origin of man. The remains of the *Pithecanthropus erectus* found in Java, as well as the numerous finds still being made of the *Sinanthropus pekinensis*, the "Peking man," in China, show without any doubt whatever, like all later forms of primitive man, that they cannot be compared with any other anthropoid ape than the chimpanzee. In East Africa a new discovery has been added in the form of the *Africanthropus njarasensis*.

Thus there were once forms also bridging the physical differences between anthropoid apes and man. There is no longer a "missing link." In spite of this, of course, every fossilized human remain is extremely welcome for the gaining of further knowledge. The earth still owes us many a witness to show us above all the transformation of the bones of the limbs. It is natural that the skull, containing as it does the brain, shows the gradual development better than the bones of the limbs.

WHAT LIES AHEAD ?

How will the future geological manifestations of the development of the earth affect the existence of man? There can be no doubt that the earth will undergo further changes. The question is whether we have finally passed the glacial periods of the Pleistocene or whether we are living in an interglacial period soon to be followed by a new ice age. This "soon" may be no more than ten thousand years from now. From the point of view of historical periods, this may seem a very long time; from the point of view of geology or even that of the limited period of man's existence, this is not much. However, an expansion of glaciers could be evaded by the human race, although not without considerable conflicts. But it is probable that, at one time, geological changes will take place which will have more far-reaching effects than a glacial advance which, after all, is an event limited to certain regions. And then it will be a question whether the highly specialized civilized man will be able by dint of his achievements to cope with such geological difficulties, or whether, on the contrary, the more primitive races will be better able to adapt themselves to the new environment and thus take the place of present-day civilized mankind.

But this does not exhaust the problems of the future. We can assume more or less with certainty that a time will come again in which plants will no longer be able to assimilate carbohydrates from water and air. Supposing that a future race of man were still to inhabit the earth at that time, the question would arise whether it would be capable of artificially creating the conditions for assimilation of carbon dioxide and albumen which Nature could no longer provide. It is hardly possible to give a positive answer to this question. Just as from the very beginning man could not exist on earth without plants and animals, it is useless to imagine a future race of men which is able alone to create the necessary conditions of existence.

The time which man has spent on earth since his origin is short in comparison to the course of earth's history so far; and we may assume that the period of human existence ahead of us will again be but a brief segment of the time which is still allotted to our planet in the universe.